

SECTION 604 - WET WELL MOUNTED LIFT STATION

1. GENERAL

The contractor shall furnish and install one factory-built, automatic pumping station. The station shall be complete with all needed equipment, factory-installed on a welded steel base with a fiberglass cover.

The principal items of equipment shall include two vertical, close-coupled, motor driven, vacuum primed, non-clog sewage pumps; valves; internal piping; control panel with circuit breakers; motor starters and automatic pumping level controls; heater; ventilating blower; priming pumps and appurtenance; and all internal wiring.

2. OPERATING CONDITIONS

Each pump shall be capable of delivering _____ GPM of raw unscreened sewage against a total dynamic head of _____ feet. The maximum allowable speed shall be 1170 RPM. The rated horsepower of each pump motor shall be _____. The maximum static suction lift shall be _____ feet.

All openings and passages shall be large enough to permit the passage of a sphere 3" in diameter and any trash or stringy material which will pass through a 4" house collection system. The anticipated operating head range is from _____ feet minimum to _____ feet maximum.

3. CONSTRUCTION

The station shall be constructed in one complete factory-built assembly. It shall be sized to rest on the top of the wet well as detailed in the construction drawings. The supporting floor plate shall be a minimum 3/8" thick steel with broken down edges or other reinforcing, as required, to prevent deflection and to ensure a rigid support.

The pump station shall be enclosed by a hinged fiberglass cover. The cover shall have a suitable drip-lip around the edge and shall be provided with a hasp and staple connection to the floor plate to allow the pump chamber to be locked with a padlock.

The cover shall have a latch mechanism to keep the cover open under load. Adjustable ventilating louvers shall be provided on each end of the fiberglass cover which are capable of being closed during cold weather operation. A steel manway cover located exterior to the fiberglass pump chamber shall be provided, complete with padlocking provisions. The manway shall be an integral part of the station floor plate and provide access to the wet well.

A stanchion with lifting arm shall be provided to lift each pump. The lifting arm shall have a hook over the center of the motor to support a hoist (provided by others) to facilitate easy removal of the motors, impellers and pumps from the station.

The pump volutes and discharge piping shall be mounted in relation to the floor plate as detailed in the construction drawings.

4. WELDING

All steel structural members shall be joined by electric arc welding with welds of adequate section for the joint involved. Where required to exclude ground water, joints on the exterior of the station shall be continuous throughout their length.

5. PROTECTION AGAINST CORROSION

After welding, all inside and outside surfaces of the structure shall be blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld splatter and roughness shall be removed by grinding. Immediately following the cleaning, a single heavy inert coating shall be factory-applied to all inside and outside surfaces prior to shipment. This coating shall be "Versapox" epoxy resin especially formulated for abrasion and corrosion resistance. The dry coating shall contain a minimum of 85% epoxy resin with the balance being pigments and thixotropic agents.

6. SEWAGE PUMPS

The pumps shall be _____ vertical, non-clog sewage pumps of heavy cast iron construction, especially designed for the use of mechanical seals and vacuum priming. In order to minimize wear caused by lineal movement of the shaft the shaft bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing. To minimize seal wear resulting from shaft deflection caused by the radial thrust of the pump, the shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of 1 7/8" for motor frame sizes 213 through 286; 2 1/8" for motor frame sizes 324 and 326; and 3" for frame 364 and larger. The dimension from the lowest bearing to the top of the impeller shall not exceed 6". The bearing nearest the impeller shall be designed for the combined thrust and radial load. The upper bearing shall be free to move lineally with the thermal expansion of the shaft and shall carry only radial loads. The shaft shall be solid stainless steel through the pump and bottom bearing to eliminate corrosion within the pump or the mechanical seal. Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified minimum diameter. The pump impellers shall be of the enclosed type made of close-grained cast iron and shall be balanced. The impeller shall be keyed with a stainless steel key and secured to the motor shaft by a stainless steel cap screw equipped with a Nylock or other suitable self-locking device. The impeller shall not be screwed or pinned to the motor pump shaft and shall be readily removable without the use of special tools. To prevent the buildup of stringy materials, grit and other foreign particles around the pump shaft, all impellers less than full diameter shall be trimmed inside the impeller shroud. The shroud shall remain full diameter so that close minimum clearance from shroud to volute is maintained. Both the end of the shaft and bore of the impeller shall be tapered to permit easy removal of the impeller from the shaft. The pump shall be so constructed so as to permit priming from the low pressure area behind the impeller. Priming from high pressure connection tending to cause solids to enter and clog the priming system, will not be acceptable. The priming bowl shall be transparent to enable the operator to monitor the priming level. The pump shall be arranged so that the rotating element can easily be removed from the volute without disconnecting the electrical wiring or disassembling the motor, impeller, backhead or seal, so that any foreign object may be removed from the pump or suction line.

The pump shaft shall be sealed against leakage by a single mechanical seal constructed so as to be automatically drained and primed each time the pump is drained and primed. Water which lubricates the mechanical seal shall be automatically drained

from around the seal if the pump loses prime, in order to allow both the pump and the seal to be drained, thereby preventing freezing and breakage of the seal during power outages in sub-freezing temperatures. The seal shall be of carbon and ceramic materials with the mating surfaces lapped to a flatness tolerance of one light band. The rotating ceramic shall be held in mating position with the stationary carbon by a stainless steel spring. The pump volute shall be furnished with mounting lugs and be bolted to the station floor plate, forming a gas-tight seal.

7. MOTORS

The pump motors shall be vertical, solid shaft, NEMA P-base, squirrel-cage induction type, suitable for _____ phase, _____ cycle, _____ volt electric supply. They shall have class F insulation, suitable for temperatures up to 105 °C. Insulation temperature shall, however, be maintained below 80 °C. The motors shall have normal starting torque and low-starting current, as specified by NEMA design B characteristics. They shall be open drip-proof design with forced air circulation by integral fan. Openings for ventilation shall be uniformly spaced around the motor frame. Leads shall be terminated in a cast connection box and shall be clearly identified. The motors shall have 1.15 service factor. The service factor shall be reserved for the owner's protection. The motors shall not be overloaded beyond their nameplate rating, at the design condition, nor at any head in the operating range as specified under Operating Conditions. The motor-pump shaft shall be centered, in relation to the motor base, within .005". The shaft runout shall not exceed .003".

The motor shaft shall equal or exceed the diameter specified under sewage pumps, at all points from immediately below the top bearing to the top of the impeller hub. A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant. The motor shall be fitted with heavy lifting eyes, each capable of supporting the entire weight of the pump and motor.

8. CONTROLS

The control equipment shall be mounted in a NEMA type 1 steel enclosure with a removable access cover. The circuit breakers, starter reset buttons, and control switches shall be operable without removing the access cover, for deadfront operation. A grounding type convenience outlet shall be provided on the side of the cabinet for operation of 115 volt AC devices. Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short circuit protection of all motor control and auxiliary circuits. Magnetic across-the-line starters with under-voltage release and overload coils for each phase shall be provided for each pump motor to give positive protection. Each single phase auxiliary motor shall be equipped with an over-current protection device in addition to the branch circuit breaker, or shall be impedance protected. All switches shall be labeled and coded wiring diagram shall be provided. To control the operation of the pumps with variations of sewage level, and set at the levels shown on the drawings, three (3) mercury displacement switches shall be provided. A minimum of 30' of cord shall be provided with each switch to eliminate the hazards created by splicing. The cord shall have a corrosion resistant vinyl jacket and be multi-stranded in order to prevent fatigue. An automatic alternator with manual switch shall be provided to change the sequence of operation of the pumps every eight hours. The manual switch shall allow for either pump to be selected as base pump or for automatic alternation. Alternating the pumps at less than 8-hour intervals will not be acceptable. Provisions shall also be made for the pumps to operate in parallel should the level in the wet well continue to rise above the starting level

pump.

9. VACUUM PRIMING SYSTEM

A separate and independent priming system shall be furnished for each sewage pump, providing complete standby operation. Each priming system shall include a separate vacuum pump. Vacuum pumps shall have corrosion resistant internal components. They shall each be capable of priming the sewage pump and suction piping in not greater than 60 seconds, under rated static suction lift conditions of 20' at mean sea level. Each priming system shall be complete with vacuum pump, vacuum solenoid valve, prime level sensing probe, and a float operated check valve installed in the system ahead of the vacuum pump to prevent liquid from entering the vacuum pump. The float-operated check valve shall have a transparent body for visual inspection of the liquid level and shall be automatically drained when the vacuum pump shuts off. The priming system shall automatically provide positive lubrication of the mechanical seal each time the sewage pump is primed. To prevent excessive stoppage due to grease accumulation, no passageway in the priming system through which sewage must pass shall be smaller than the equivalent of a 2 1/2" opening.

10. ENVIRONMENTAL EQUIPMENT

A ventilating blower shall be provided, capable of delivering 250 cfm at 0.4" static water pressure, in order to remove the heat generated by continuous motor operation. The ventilating blower shall be turned on and off automatically by a pre-set thermostat. The ventilating blower shall be rigidly mounted from the station floor. The discharge outlet shall have a thick resilient gasket which will match with a louvered opening in the fiberglass cover to seal the discharge to the cover when the cover is closed. An electric heater controlled by a pre-set thermostat shall be furnished. The heater shall be rigidly mounted in the station to prevent removal.

11. SEWAGE PIPING

The pump suction shall be drilled and tapped for 125 pound American Standard flange for ready connection of the suction riser. The discharge line from each pump shall be fitted with a clapper-type check valve and eccentric plug valve. The check valves and plug valves shall be installed above the floor plate. The check valve shall be spring loaded type with external lever arm and an easily replaced resilient seat for added assurance against vacuum leaks. Check valves shall have stainless steel shaft with replaceable bronze shaft bushings and shall be sealed through the bearings with O-rings. An operating wrench shall be provided for the plug valves. Protrusions through the floor plate shall be gas-tight where necessary to effect sealing between the equipment chamber and the wet well. Bolted and sealed joints shall be provided at the volutes or suction pipes in order to prevent corrosive, noxious fumes from entering the station. The lift station manufacturer shall extend the suction and discharge connections below the floor the floor plate at the factory, so that field connections can be made without disturbing the gas-tight seals. The manufacturer of the lift station shall provide a compression-type sleeve coupling for installation in the common discharge pipe.

12. FACTORY TESTS

All components of the pump station shall be given an operational test of all equipment at the factory to check for excessive vibration, for leaks in all piping or seals, for correct operation of the vacuum priming and control systems and all auxiliary equipment. Pumps shall take suction from a deep well, simulating actual service condition.

13. SPARE PARTS

A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be packed in a suitable container and shall include complete installation instructions. A spare volute and seal gasket shall be provided.

14. INSTALLATION AND OPERATING INSTRUCTIONS

Installation of the pump chamber shall be done in accordance with the written instructions provided by the manufacturer. Operation and maintenance manuals shall be furnished which will include parts lists of components and complete service procedures and troubleshooting guide.

15. GUARANTEE

The manufacturer of the lift station shall have a minimum of five years experience in the design and manufacture of vacuum-priming type factory-built automatic pumping stations and shall guarantee the structure and all equipment to be free from defects in materials and workmanship for a period of up to one year from date of start-up, not to exceed 18 months from the date of shipment. Warranties and guarantees by the suppliers of various components in lieu of a single-source responsibility by the manufacture will not be accepted. The manufacturer shall be solely responsible for the guarantee of the station and all components.

In event a component fails to perform as specified or is proven defective in service during the guarantee period, the manufacturer shall provide a replacement part without cost to the owner. He shall further provide, without cost, such labor as may be required to replace, repair or modify major components such as the pumps, pump motors and sewage piping manifold.

16. HIGH LEVEL SENSOR

Two high level alarm mercury switches shall be provided. One switch shall be open in the non-alarm condition and shall close when a high level condition exists. The second switch shall be closed in the non-alarm condition and open on high level. The two switches shall activate at the same level. Alarm switches shall be wired to a terminal strip for connection to other equipment.

17. RUNNING TIME METERS

Running time meter shall be supplied for each pump to show the number of hours of operation. The meter shall be enclosed in a dust and moisture proof molded plastic case. The flush mounted dial shall register in hours and tenths of hours up to 99999.9 hours before repeating. The meter shall be suitable for operation from a 115 volt, 60 cycle supply.

18. INSULATED FIBERGLASS HOOD

The wet well mounted pump station shall be enclosed by a hinged, insulated, fiberglass cover, complete with drip lip, cutouts for ventilation system and hasp to allow the pump station to be locked with a padlock. The insulation shall be a minimum of 1" urethane.

19. EXPERIENCE AND WORKMANSHIP

The pump station shall be the product of a manufacturer with a minimum of five (5)

years of experience in the design and building of such automatic factory-built sewage pumping stations and all workmanship and materials throughout shall be of the highest quality.

20. MANUFACTURER

These specifications describe a factory-built lift station as manufactured by Smith & Loveless, Inc. of Lenexa, Kansas. A factory-built lift station of other manufacture of equal design, equipment, and materials may be offered. To receive consideration on any alternate, full descriptive material must be submitted to the Engineers 7 days prior to date of receiving proposals by the Owner, for purposes of evaluation. The descriptive material on any alternate must include: detailed specifications on the steel structure, corrosion protection, each item of equipment, wiring diagram, dimension prints, and a list of representative installations.

21. EXTERIOR ELECTRICAL WORK

Conduit and conductors shall be extended underground from the connection of the sewage lift station to the base of the service pole to be furnished and set by the power company. Conduit shall then be extended to terminate in a suitable weatherhead, at the top of the service pole, with sufficient slack wire left for connection to the aerial secondary by others. The Contractor shall furnish and install a disconnect switch on the pole, the switch to be located approximately 5 feet above grade. The disconnect switch shall be encased in a suitable weatherproofed case. The power company will furnish a meter housing and meter socket to be installed by the Contractor.

22. FINAL INSPECTION

When the lift station is completed and ready to begin functioning, the Contractor shall notify the manufacturer. The manufacturer shall provide a representative who is qualified in the operation of lift stations. The representative shall place the lift station in operation, make all necessary adjustments required for proper operation and instruct the Owner's operator on the operation of the lift station.